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Box Patent Application
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Washington, D.C. 20231

PATENT FILING TRANSMITTAL

Transmitted herewith for filing is the Patent Application of: Nicholas R. Dono and Bengt-Olaf Schneider

For: METHODS AND APPARATUS FOR SELF DESCRIBING DEVICES

TYPE OF FILING

This new patent application is for a(n):

[X]   Utility
[ ]   Design
[ ]   Plant
[ ]   Divisional
[ ]   Continuation
[ ]   Continuation-in-part

Benefit of a prior filed application

[ ]   This application claims the benefit of an earlier filed U.S. Patent Application under 35 USC 120.
[ ]   Please accord Applicant the benefit of the priority date of _____to this case pursuant to 35 USC
119. Applicant's claim for priority is based on application _____filed in _____on that date.

Filing under 37 CFR 1.53 (Utility) or 37 CFR 1.153 (Design)

[X]   This is an application filed pursuant to 37 CFR 1.53 or 37 CFR 1.153, permitting receipt of a filing date
upon filing of a specification, at least one claim and necessary drawings.
[X]   In the event any parts of this application are incomplete, please treat this as a filing under 37 CFR 1.53 or
37 CFR 1.153.

ENCLOSURES

[X]   _11_ - pages of written description;
[X]   _8_ - pages of claims;
[X]   _1_ - pages of abstract;
[ ]   ___ - sheets of formal drawings;
[X]   _3_ - sheets of informal drawings;
[X]   Declaration and Power of Attorney or listing of inventors;
and
[X]   Two postcards for return to us as proof of receipt of the above documents.

plus
[X]   An Assignment of the invention to IBM Corporation and an Assignment cover sheet;
[ ]   Verified Statement Claiming Small Entity Status (37 CFR 1.9(f) and 1.27(b))
[ ]   Form PTO-1449 (IDS) and two copies of the references listed thereon;

[ ]   A certified copy of_____(country) patent application number (priority document).

[ ]   A preliminary amendment;

[ ]   Declaration of Biological Deposit;

[ ]   Submission of sequence listing, computer readable copy and/or amendment relating thereto for biotechnology invention containing nucleotide and/or amino acid sequence;

[ ]   An associate power of attorney;

[ ]   Other.

DECLARATION OR OATH

The enclosed Declaration or Oath has been executed by:

[X]   Inventor(s);

[ ]   Legal representative of the inventors (37 CFR 1.42 or 1.43);

[ ]   Joint inventor or person showing proprietary interest on behalf of an inventor who refused to sign or who cannot be reached and this is a petition required by 37 CFR 1.47 and the statement required by 37 CFR 1.47 is attached;

[ ]   Has not been executed and is enclosed for the purposes of identifying the inventors.

INVENTORSHIP STATEMENT

The inventorship for all the claims in this application is:

[ ]   the same;

[ ]   not the same and, as an explanation, a statement is/ will be submitted.

LANGUAGE

The application submitted herewith is:

[X]   in English;

[ ]   in not in English and in terms of 37 CFR 1.52(d) a verified translation is

        [ ]   attached

        [ ]   not attached.

FEE CALCULATION

The filing fee has been calculated as shown below:

	SMALL ENTITY	OR	OTHER THAN A SMALL ENTITY	
BASIC FEE Design Patent	*$155*	$	$310	$
BASIC FEE Utility Patent	$345	$	$690	$690
EXTRA FEES	RATE	FEE	RATE	FEE
TOTAL CLAIMS 32 MINUS 20= 12	x 9=	$0	x18=	$216
INDEP.CLAIMS 4 MINUS 3 = 1	x 39=	$0	x78=	$78
[ ] MULTIPLE DEP.CLAIM	+135=	$	+270=	$
[X] ASSIGNMENT	+ 40=	$	+40=	$40
[ ] RULE 53 SURCHARGE	+ 65=	$	+130=	$
TOTAL		$		$1,024

FEE PAYMENT

[X]   Attached is Check No.__6106__ in the sum of $1,024.00 to cover the filing fee and, if applicable, the assignment fee.

Respectfully submitted,

Dated: February 12, 2000

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s)	: Nicholas R. DONO et al	Group Art:	not yet assigned
Serial No.	: not yet assigned	Examiner:	not yet assigned
Filed	: herewith		
For	: METHODS AND APPARATUS FOR SELF-DESCRIBING DEVICES		

EXPRESS MAIL CERTIFICATE

Express Mail Label No. EL503717142US
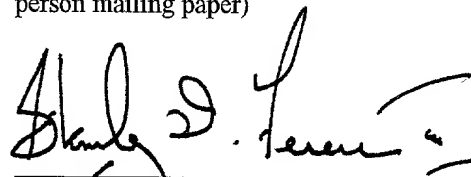
Date of Deposit __12 February 2000__

     I hereby certify that the following attached paper(s) or fee:

> Patent Application
> > Written Description
> > Claims 1-32
> > Abstract
> > Drawings (Figs. 1-4)
> Declaration and Power of Attorney
> Assignment with Cover Sheet
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> Certificate of Express Mail
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are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service

under 37 C.F.R. 1.10 on the date indicated above and is addressed to the Assistant Commissioner for

Patents, Washington, D.C. 20231.

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METHODS AND APPARATUS FOR SELF-DESCRIBING DEVICES

Field of the Invention

The present invention generally relates to devices, such as hardware components, for being integrated with a computer system and arrangements and methods for integrating

5 such devices with a computer system.

Background of the Invention

In the context of many known operating systems, it is possible to integrate different devices, such as hardware components, with the operating system through device drivers. Device drivers are low-level software programs that translate abstract device

10 commands, as specified in the operating system's device interface, into actual commands issued to the hardware device.

One problem commonly encountered is that device drivers must be updated in order to eliminate bugs, to improve the performance of the integrated device or to enhance the functionality of the device. The updating of device drivers is typically accomplished by

15 obtaining a new device driver from the device manufacturer, e.g., on a storage device such as a diskette or CD-ROM or via the downloading of one or more device driver files from the manufacturer's web site.

In the realm of software, as well, certain arrangements for updating are known. Examples include Intuit's *TurboTax*, where the software periodically queries the user whether to check the Intuit web page for updated versions of the software and/or newer versions of the tax forms. With Norton's *AntiVirus*, the software periodically checks

5   whether updated virus signature files are available on the company web site. With the IBM *Global Network Dialer*, when there is a connection to the internet, the software determines whether a newer version of the software and/or a newer version of the phone number list is available and asks the user whether to update.

None of the software programs just described, however, implement the concept of

10   storing the necessary software components within a physical device itself. Furthermore, all of the programs in question rely on proprietary solutions to implement the function of automatic updates, instead of using a common protocol to test and update existing versions of the software.

To a degree, dynamic reconfiguration is available today (e.g., plug 'n' play of PC-

15   cards) and will likely become more widespread over the next few years. However, when integrating new devices into a computer system one or more of the following problems often occurs:

- The operating system does not know the type of device and does not have the proper device driver file or files.

- Although the operating system knows about the device, the device driver is not available on the system and must be loaded from the operating system's install medium (e.g., tape, diskette, CD-ROM)

- The operating system knows the device but a back-level (old) version of the device driver is available within the system.

In view of the foregoing, a need has been recognized in connection with providing arrangements and methods for more efficiently configuring a computer system with new hardware components.

Summary of the Invention

The present invention, in accordance with at least one presently preferred embodiment, overcomes the disadvantages and shortcomings of previous efforts by storing the device driver on the device itself from where it can be loaded by the operating system.

Preferably, the information stored on the device will have at least the following three components:

- A description of the device through a unique ID and some textual, human-readable description.

- The device driver file(s) with version numbers.

- Information on how to obtain newer versions of the device driver, e.g., a URL.

5   Preferably, the aforementioned information will be exchanged over a common protocol supported by the operating system and all such devices.

For a better understanding of the present invention, together with other and further features and advantages thereof, reference is made to the following description, taken in conjunction with the accompanying drawings, and the scope of the invention will be

10   pointed out in the appended claims.

Brief Description of the Drawings

Figure 1 schematically illustrates a computer system with attached device.

Figure 2 schematically illustrates the internal structure of a device.

Figure 3 illustrates a flow diagram that sets forth a protocol for integrating a

15   device with an operating system.

Figure 4 schematically illustrates the integration of a device with into typical device driver stacks.

Description of the Preferred Embodiments

Figure 1 shows a schematic high-level view of a computer system 101 with an attached device 102. The device 102 is connected to the computer system 101 via an interface 101. For example, the device 102 can be a graphics adapter or a disk drive and the interface can be a PCI bus or an IDE connection. Essentially, device 102 could be any component originally separate from computer system 100 that is to be subsequently integrated with the computer system 100 and for which, conventionally, a rather involved installation procedure may be required. Thus, for instance, device 102 could also be a modem, a printer, a sound card, a video card, a graphics card, a IDE or SCSI adapter, a network interface card, a network controller, a CD ROM drive, or a tape drive.

In Figure 2, the internal structure of the device 102 is schematically shown. Preferably, in addition to the actual functioning components of the device, e.g., device logic, depicted by block 203, there is also a device description subsystem 200. This subsystem 200 preferably includes two main parts: a non-volatile, read-write memory 201 and interface logic 202. The interface logic 202 interprets commands received over the

computer-device interface 101 and controls the non-volatile memory 201, which contains the locally stored device driver.

The commands understood by the interface logic 202 preferably support the following functions:

5   *I.   Device Identification*: This function returns a unique identifier and a textual device name. The identifier allows the computer system and its operating system to positively identify the device. The name can be used by the operating system to present to the user the device(s) attached to the computer system.

II.   Device Driver Versions: This function returns version information about the

10   device driver stored on the device. Versions are defined e.g., by a triplet of numbers that indicate major version, minor version and release number.

III.   Read Device Drivers: This function allows the operating system to obtain a copy of the device driver for installation.

IV.   Get Link to Device Driver Data: This function provides a reference to a

15   network location, e.g., a URL, where the most recent version of the device driver can be found.

V.   *Update Device Drivers*: This function allows updating the device driver information stored on the device with a more recent version.

VI.   *Update Link*: This function allows to update the location of where to find the latest version of a given device driver. (Preferably, the device manufacturer will maintain such locations with care in order not to send queries to non-existing sites.)

Figure 3 is a flow diagram that illustrates how the operating system interacts with the device in accordance with an embodiment of the present invention. If the computer system detects a new device (step 301) through essentially any suitable known method, it first determines the device identification (302). Based on the device identification, the operating system can decide whether this device is already known (303). If not, it retrieves the link from the device (304); otherwise that link is already known. Then, a test (305) is performed to determine whether the link is accessible; e.g., if the computer system is not attached to a network a URL cannot be resolved. If the link is not accessible, then the existing local device driver ("old" device driver) will be used. If the link is accessible, however, the available (local) driver version is tested against the remote version to find out whether a more recent one is available (307). The newer one of the remote and local version is then installed by the operating system [OS] (309, 313) and if necessary downloaded into the device (310).

Figure 4 shows how device driver stacks, as they are presently used in many operating systems (e.g., Microsoft Windows), can integrate a device description arrangement in accordance with at least one embodiment of the present invention. The physical device drivers (403), e.g., a PCI (peripheral component interconnect) bus driver

5   or a SCSI (small computer system interface) driver is accessed by two higher-level drivers. The device-specific driver 402 is the standard device driver that addresses the actual function of the device. The generic device driver 401 in conjunction with the operating system 400 implements the algorithm of Figure 3 described above.

Several practical scenarios can help illustrate the advantages that may be enjoyed

10   in connection with a device describing arrangement provided and utilized in accordance with at least one embodiment of the present invention. For instance, if a device is connected to a stand-alone (i.e., not network connected) computer system, then the device driver can be loaded directly and automatically from the device without the need to find the OS installation CD.

15   If a device is connected to a network-connected computer, then the most recent device driver can be retrieved from the location stored on the device. If the latest device driver is already stored on the device, no lengthy download over the network is required as the device driver is retrieved directly from the device.

As another advantage, the device driver on a device can be updated with a newer

driver from the network on a network-connected computer or from other media like a

CD-ROM or diskette.

A device description arrangement, in accordance with at least one alternative

5   embodiment of the present invention, can be used to configure any network devices or

resources and install the necessary drivers. Such network devices or resources may

include printers, fax machines, and scanners. In this case, the necessary drivers are stored

inside the device or resource. Upon request or automatically, the computer system

enumerates all the network devices or resources available locally and within a network

10   neighborhood (e.g., on the same subnet or ring). All such network devices or resources

would thus be automatically installed and made available to the user.

As a variation on the process described above and shown in Figure 3, a computer

system may periodically check the currently installed driver against the version available

on the remote site. If a newer driver is detected, it is downloaded, installed and updated

15   on the device.   The predetermined time intervals at which such periodic checking may

take place can be chosen depending on the volatility associated with the driver in question.

For example, it is conceivable to check for new versions of graphics and network card

drivers at significantly frequent intervals, in view of the fact that these are typically

updated quite often, while versions of printer drivers, on the other hand, might not need to

be checked upon quite so frequently since these do not tend to be updated very often.

A further variation on the basic algorithm described above and shown in Figure 3

resides in querying the user as to whether to download a new driver in cases of a low-

5   bandwidth connection (e.g., phone line). The user may then decide to defer the download

to a time when a better connection becomes available.

The process described and illustrated heretofore with respect to Figure 3 can be

applicable both to cold-plugging (before power-on) and to hot-plugging (during

operation) of new devices.

10   At least one presently preferred embodiment of the present invention broadly

contemplates the installation of drivers over networks. Particularly, instead of storing the

actual driver with the device, the device might only store a reference to a network location

where to find the driver. For instance, for the purpose of facilitating integration with an

operating system, a printer may have nothing more than an internet address that holds

15   different printer drivers. The advantage of this setup is that it eliminates the need for

checking the device driver version stored on the device and then conditionally updating it

from the web. Instead, the most recent version would always be retrieved from the web.

In this connection, less storage would be required on the device, the possibility would

arise of setting up a website with company-specific drivers, and the maintenance of devices would be easier (since there is only one location holding drivers).

It is to be understood that the present invention, in accordance with at least one presently preferred embodiment, includes an arrangement, inherent to a device, for facilitating the integration of the device with a computer operating system. The arrangement may be implemented in conjunction with at least one general-purpose computer running suitable software programs. It may also be implemented on at least one Integrated Circuit or part of at least one Integrated Circuit. Thus, it is to be understood that the invention may be implemented in hardware, software, or a combination of both.

If not otherwise stated herein , it is to be assumed that all patents, patent applications, patent publications and other publications mentioned and cited herein are hereby fully incorporated by reference herein as if set forth in their entirety herein.

Although illustrative embodiments of the present invention have been described herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to those precise embodiments, and that various other changes and modifications may be affected therein by one skilled in the art without departing from the scope or spirit of the invention.

Claims

What is claimed is:

1. A device for being integrated with a computer operating system, said device comprising:

5   at least one hardware component; and

at least one description subsystem associated with said at least one hardware component;

said at least one description subsystem being adapted to facilitate integration of said device with a computer operating system.

10   2. The device according to Claim 1, wherein said at least one description subsystem comprises interface logic for interpreting commands received over an interface between said device and a computer operating system.

3. The device according to Claim 2, further comprising:

non-volatile memory;

15   said interface logic being adapted to control said non-volatile memory.

4. The device according to Claim 2, wherein said interface logic is adapted to facilitate identification of said device.

5. The device according to Claim 2, further comprising:

a device driver;

5   said interface logic being adapted to facilitate the provision of information to a computer operating system relating to the version of said device driver.

6. The device according to Claim 2, wherein said interface logic is adapted to assist a computer operating system in obtaining a copy of a device driver for installation in said device.

10   7. The device according to Claim 2, wherein said interface logic is adapted to provide a reference to a network location where a recent version of a device driver is obtainable.

8. The device according to Claim 7, wherein said interface logic is adapted to facilitate the updating of a network location at which a recent version of a device driver is 15   obtainable.

9. The device according to Claim 2, wherein said interface logic is adapted to facilitate the updating of device driver information stored on said device.

10. The device according to Claim 2, further comprising:

a locally stored device driver, stored on said device;

said interface logic being adapted to compare said locally stored device driver with a remotely stored device driver so as to determine which of said device drivers is of a newer version and to prompt usage of the newer version.

11. The device according to Claim 2, further comprising:

a locally stored device driver, stored on said device;

said interface logic being adapted to prompt usage of said locally stored device driver if a remotely stored device driver is not accessible.

12. The device according to Claim 2, further comprising:

a locally stored device driver, stored on said device;

said interface logic being adapted to compare said locally stored device driver with a remotely stored device driver at predetermined time intervals so as to determine which of said device drivers is of a newer version.

13. The device according to Claim 1, wherein said device comprises a printer.

5   14. The device according to Claim 1, wherein said device comprises a modem.

15. The device according to Claim 1, wherein said device comprises a graphics card.

16. The device according to Claim 1, wherein said device comprises a sound card.

17. The device according to Claim 1, wherein said device comprises a IDE disk

10   controller.

18. The device according to Claim 1, wherein said device comprises a SCSI disk controller.

19. The device according to Claim 1, wherein said device comprises a network controller.

20. A method of integrating a device with a computer operating system, said method comprising facilitating integration of said device with a computer operating system via at least one component associated with said device.

21. The method according to Claim 20, wherein said facilitating of integration comprises facilitating identification of said device.

22. The method according to Claim 20, further comprising:

providing a device driver associated with said device;

said facilitating of integration comprising facilitating the provision of information to a computer operating system relating to the version of said device driver.

23. The method according to Claim 20, wherein said facilitating of integration comprises assisting a computer operating system in obtaining a copy of a device driver for installation in said device.

24. The method according to Claim 20, wherein said facilitating of integration comprises providing a reference to a network location where a recent version of a device driver is obtainable.

25. The method according to Claim 20, wherein said facilitating of integration comprises the updating of a network location at which a recent version of a device driver is obtainable.

26. The method according to Claim 20, wherein said facilitating of integration comprises facilitating the updating of device driver information stored on said device.

27. The method according to Claim 20, further comprising:

storing a device driver locally on said device;

said facilitating of integration comprising comparing said locally stored device driver with a remotely stored device driver so as to determine which of said device drivers is of a newer version and to prompt usage of the newer version.

28. The method according to Claim 20, further comprising:

storing a device driver locally on said device;

said facilitating of integration comprising prompting usage of said locally stored device driver if a remotely stored device driver is not accessible.

29. The method according to Claim 20, further comprising:

storing a device driver locally on said device;

said facilitating of integration comprising comparing said locally stored device driver with a remotely stored device driver at predetermined time intervals so as to

5   determine which of said device drivers is of a newer version.

30. The method according to Claim 20, further comprising:

storing a device driver locally on said device;

said facilitating of integration comprising comparing said locally stored device driver with a remotely stored device driver so as to determine which of said device drivers

10   is of a newer version and querying a user to choose between versions.

31. A program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform method steps for facilitating the integration of a device with a computer operating system via at least one component associated with the device.

32. A device for being integrated with a computer operating system, said device comprising:

a hardware component; and

a device driver stored on said hardware component.

5

METHODS AND APPARATUS FOR SELF-DESCRIBING DEVICES

Abstract of the Disclosure

Methods and arrangements for facilitating the integration of devices, such as hardware components, with a computer operating system or the like. Contemplated

5   herein are self-describing devices that serve to eliminate one or more intermediate steps commonly encountered heretofore.
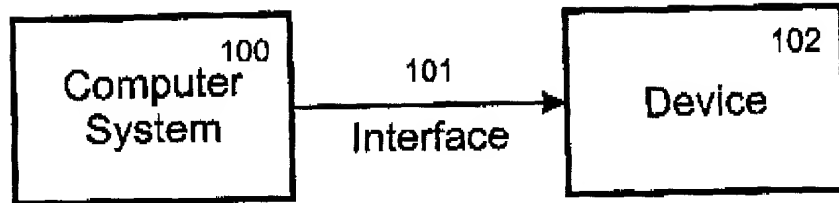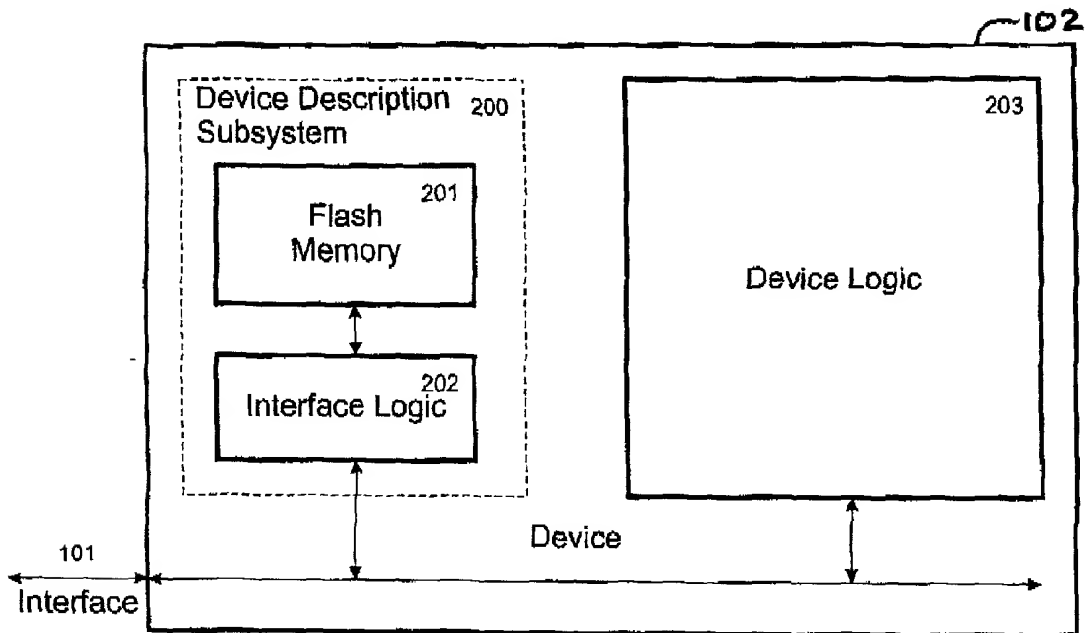
FIG. 1

FIG. 2

301 (New Device Detected)

302 | Get Device ID |

303 < Device known >

304 | Get Device Link | — Yes

No

305 < Link accessible > — No

Yes

306 | Get version of local and remote device driver |

Done (Use old device driver)

307 < Remote driver newer than local driver >

Yes

308 | Get remote device driver |

309 | Install device driver (in OS) |

310 | Update device driver (in dev.) |

No

311 < Device known >

No

312 | Get local device driver | — Yes

313 | Install device driver (in OS) |

Done

FIG. 3

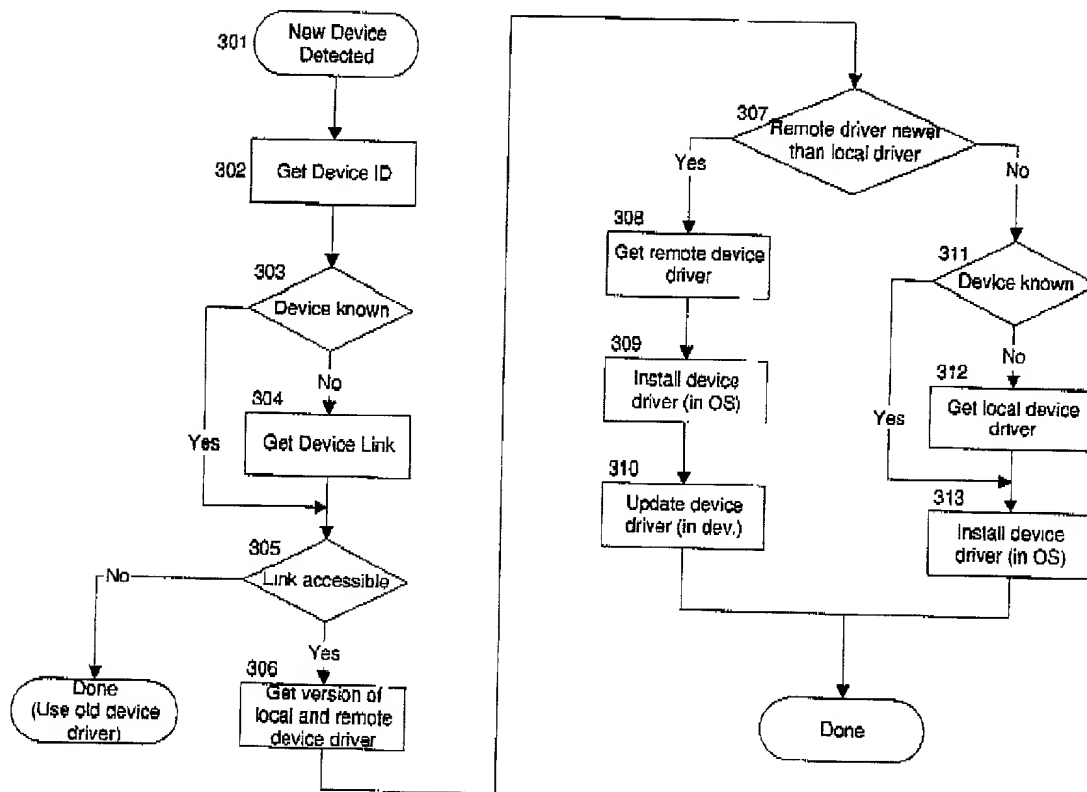| 400 Operating System	
401 Generic Device Driver	402 Specific Device Driver
403 Physical Device Driver	

Fig. 4

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

METHODS AND APPARATUS FOR SELF-DESCRIBING DEVICES

the specification of which (check one)

__X__ is attached hereto.

_____ was filed on _____ as International Business Machines Docket No. YO999-567

ket PCT International Application Number

and was amended on _____ (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application, having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)   Priority Claimed

_____   _____   _____ ___ Yes ___ No
   (Number)   (Country)   (Day/Month/Year Filed)

_____   _____   _____ ___ Yes ___ No
   (Number)   (Country)   (Day/Month/Year Filed)

_____   _____   _____ ___ Yes ___ No
   (Number)   (Country)   (Day/Month/Year Filed)

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

_____   _____
(Application Number)   (Filing Date)

_____   _____
(Application Number)   (Filing Date)

DELARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

I hereby claim the benefit under 35 U.S.C. §120 of any United States Application(s), or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States, or PCT International application in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose information material to the patentability of this application as defined in 37 CFR §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)

(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith (list name and registration number).

Manny W. Schecter (Reg. 31,722), Terry J. Ilardi (Reg. 29,936), Christopher A. Hughes (Reg. 26,914), Edward A. Pennington (Reg. 32,588), John E. Hoel (Reg. 26,279), Joseph C. Redmond, Jr. (Reg. 18,753), Douglas W. Cameron (Reg. 31,596), Stephen C. Kaufman (Reg. 29,551), Jay P. Sbrollini (Reg. 36,266), Wayne L. Ellenbogen (Reg. No. 43,602), Robert M. Trepp (Reg. 25,933), Louis P. Herzberg (Reg. 41,500), Louis J. Percello (Reg. 33,206), Paul J. Otterstedt (Reg. 37,411), Daniel P. Morris (Reg. 32,053), and David M. Shofi (Reg. 39,835)

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Full name of sole or first inventor

[signature]   2-10-2000
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[signature]   Feb. 10, 2000

Inventor's Signature   Date

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